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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/671,479	09/29/2003	Eduardo Gallestey Alvarez	004501-740	7970

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EXAMINER

THORNEWELL, KIMBERLY A

ART UNIT	PAPER NUMBER
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2128

DATE MAILED: 06/07/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/671,479	ALVAREZ ET AL.	
	Examiner	Art Unit	
	Kimberly Thornewell	2128	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE ____ MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 29 September 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-9 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-9 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 29 September 2003 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____. |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>9/29/03, 3/9/2005</u> . | 6) <input type="checkbox"/> Other: ____. |

DETAILED ACTION

1. Claims 1-9 are pending in the instant application.

Priority

2. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Information Disclosure Statement

3. The information disclosure statements (IDS) submitted on 9/29/2003 and 3/9/2005 are in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statement is being considered by the examiner.

Drawings

4. Figures 1, 4, 5 and 6 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). Corrected drawings in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Specification

5. The abstract of the disclosure is objected to because it contains multiple paragraphs and lists detailed steps of the claimed method. Correction is required. See MPEP § 608.01(b).
6. The disclosure is objected to because of the following informalities:
 - i. On page 1, line 16, the reference to claims 1, 8 and 9 is improper.
 - ii. On page 2, line 13, "where f1 and f1" should be "where f1 and f2."
 - iii. On page 5, line 7, the exclamation point after the word "state" is improper.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

7. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

8. Claim 9 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. Claim 9 is directed to a data processing system comprising means for carrying out the steps of the method according to claim 1. However, the

means for carrying out each step of the method have not been defined in either the claim or the specification.

9. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

10. Claims 1-9 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The first step in the method of claim 1 is directed to measuring values for measured variables *u*. One of ordinary skill in the art of process state estimation would not know what is meant by "measured variables," thus rendering the claim indefinite. Furthermore, claim 1 recites the limitation "the complete state" in line 1 of step c. There is insufficient antecedent basis for this limitation in the claim. Claims 2-9 are rejected because of their dependence on claim 1.

11. Claim 7 is further rejected because the scope of the claim is undeterminable. Independent claim 1 is directed to estimating a vector of a mathematical model using the State Augmented Extended Kalman Filter (SAEKF). Claim 7, which is dependent from claim 1 is directed to using a Recursive-Prediction-Error-Method "instead of the SAEKF." This negative limitation renders the scope of the claim undeterminable.

Claim Rejections - 35 USC § 101

12. 35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

13. Claims 1-9 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

Claim 1 is directed to a method for estimating a state of a process. The claim lacks a tangible, concrete result in that the method results in a computed estimate of the state. No action is performed with the estimated state once it is computed. Dependent claims 2-7 do not overcome the rejection of claim 1, as they further clarify the steps of the method.

Claim 8 is directed to a computer program which, when executed on a data processing unit, performs the steps of claim 1. The claim recites a product that performs the steps of a nonstatutory method. Furthermore, because the claim recites a "computer program," it is directed to software, per se.

Claim 9 is directed to a data processing system comprising means for carrying out the steps of the method according to claim 1. Similar to above, the claim is directed towards an apparatus comprising means for carrying out the steps of a nonstatutory method.

Claim Rejections - 35 USC § 102

14. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

15. Claims 1-3 and 7 are rejected under 35 U.S.C. 102(b) as being anticipated by Bohn, in his doctoral dissertation "*Recursive Parameter Estimation for Nonlinear Continuous-Time Systems through Sensitivity-Model-Based Adaptive Filters*," submitted to the Department of Electrical Engineering and Information Sciences, at Ruhr-Universitat Bochom in 2000.

As per claim 1, Bohn discloses *a method for estimating a value of a vector of variables p in a mathematical model representing a physical process (page 33 section 4.2 first paragraph), where a state vector x of the model is estimated by a State Augmented Extended Kalman Filter (SAEKF), wherein the vector of variables p represents one or more properties of the process (page xii, definition for p) and is representable by a function of the state vector x (page 35 equation 4.5), wherein the method comprises the steps of:*

- i. measuring values for measured variables u (sentence bridging pages 33 and 34, measured variable being taught as an input signal);*
- ii. incorporating the vector of variables p as an augmented state in the SAEKF (page 33 equation 4.1, definition of p on page xii), and*
- iii. computing an estimate of the complete state including the augmented state according to a SAEKF algorithm (page 35 equation 4.5).*

As per claim 2, Bohn discloses the system equations of the model estimated by the SAEKF being representable as:

$$\begin{bmatrix} \dot{x} \\ \dot{p} \end{bmatrix} = \begin{bmatrix} f(x, u, p) \\ 0 \end{bmatrix} + v \quad (\text{page 33 equation 4.2})$$

where $f(x, u, p)$ represents a known dependency of the change \dot{x} in system state from the system state x (page xiv, definition of f), the measured values u and the vector of variables p , and v represents noise disturbances (page xiii, definition of v).

As per claim 3, Bohn discloses *estimating parameters of a representation of the vector of variables p in terms of the state vector x* (page 33 equation 4.1).

As per claim 7, Bohn discloses performing the method of claim 1 using a *Recursive Prediction Error Method rather than the SAEKF* (page 54 section 4.8 lines 9-15).

Claim Rejections - 35 USC § 103

16. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

- (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

17. Claims 8 and 9 rejected under 35 U.S.C. 103(a) as being unpatentable over Bohn.

As per claim 8, Bohn does not disclose expressly a *computer program for estimating a value of a vector of variables p in a mathematical model representing a physical process which is loadable and executable on a data processing unit and which computer program, when being executed, performs the steps according to claim 1.* However, in chapter 6 of his dissertation, Bohn discusses simulation of the Kalman filters. More specifically, in section 6.2, pages 74-75, he discusses simulation of parameter estimation for a Van der Pol Oscillator using an SAEKF. Because the behavior of the Van der Pol oscillator is simulated using a simulation program in order to achieve the outputs as shown on page 76, it is obvious that the method of claim 1 could have been performed on a computer program.

As per claim 9, Bohn does not disclose expressly a *data processing system comprising means for carrying out the steps of the method of claim 1.* As described above above, chapter 6, pages 74-75 of Bohn's dissertation is drawn to simulation of the Van der Pol Oscillator using an SAEKF. Because the method of claim 1 was simulated using a simulation program, it is obvious that the method would have been executed on a computer (i.e.- a data processing system).

18. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Bohn in view of Rutherford et al., US Patent no. 6,741,955.

Bohn does not disclose expressly relating the SAEKF method to a turbomachine. Rutherford discloses a method for *estimating mass flow rate of a*

turbomachine (paragraph joining columns 1 and 2) *using an Extended Kalman Filter* (column 5 lines 18-21). It would have been obvious to one of ordinary skill in the art of process state estimation, at the time of the present invention, to modify Bohn's teachings of the SAEKF with Rutherford's mass flow estimation application of the Extended Kalman Filter. The motivation for doing so would have been to give Bohn's teachings a real-world application by estimating parameters for leak prediction (Rutherford column 5 lines 6-21).

19. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Bohn in view of Parlos et al., "An Algorithmic Approach to Adaptive State Filtering Using Recurrent Neural Networks," published in IEEE Transactions on Neural Networks, November 2001.

Bohn does not disclose expressly relating the SAEKF method to a heat exchanger. Parlos discloses a method for *estimating heat transfer coefficients in a heat exchanger using an Extended Kalman Filter* (page 1430 first full paragraph lines 1-3). It would have been obvious to one of ordinary skill in the art of process state estimation, at the time of the present invention, to modify Bohn's teachings of the SAEKF with Parlos' heat transfer estimation application of the Extended Kalman Filter. The motivation for doing so would have been to give Bohn's teachings a real-world application by estimating heat transfer parameters for a steam generator (Parlos page 1412 column 2 first bullet).

20. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Bohn in view of Draper et al., "Learning Augmented Recursive Estimation for Uncertain

Nonlinear Dynamical Systems,” published in IEEE International Symposium on Intelligent Control, September 1996.

Bohn does not disclose expressly relating the SAEKF method to a spring function. Draper discloses *modeling a spring function and backlash* (page 441 section 5 paragraph 1) *using an AEKF* (page 442 first full paragraph). It would have been obvious to one of ordinary skill in the art of process state estimation, at the time of the present invention, to modify Bohn’s teachings of the SAEKF with Draper’s spring backlash estimation application of the Augmented Extended Kalman Filter. The motivation for doing so would have been to give Bohn’s teachings a real-world application by estimating behavior of a spring (Draper, abstract).

Conclusion

21. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kimberly Thornewell whose telephone number is (571)272-6543. The examiner can normally be reached on 8am-4:30pm M-F. If attempts to reach the examiner by telephone are unsuccessful, the examiner’s supervisor, Kamini Shah can be reached on (571)272-2279. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 2128

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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